

Detoxification of Sugarcane Bagasse Dilute-Acid Hydrolyzate by Overliming for Bioethanol Production

Sepideh Shokri khaneghah¹; Mehrdad Azin*²; Hatef Ajudanifar¹

1-Department of Biology, Faculty of Science, Islamic Azad University, Damghan, Iran

2-Department of Biotechnology, Iranian Research Organization for Science and Technology, Tehran, Iran

shirin99941@yahoo.com

Background & Objectives: Due to shortage of oil reservoir and global warming caused by excessive emissions of CO₂, alternative fuels are nowadays in focus. Ethanol as a suitable substitute can be produced from lignocellulosic materials such as sugarcane bagasse. Despite the availability and low price, lignocelluloses need pre-treatment process to produce sugars for ethanol production. Dilute-acid hydrolysis is one of the efficient pre-treatment Methods but in this process by-products such as furans, aliphatic acids and phenolic compounds are produced which are inhibitors for microorganisms. Consequently detoxification methods, such as overliming may be used. Studying the effect of pH, temperature and time on overliming-detoxification for ethanol production.

Methods : Overliming was carried out in the pH 10 to 12 at two different temperatures 40 and 60, holding the pH and temperature for different periods of time, 30 and 60 minutes. Total sugar, glucose, furfural and phenolics concentrations were measured. Afterwards in all above conditions total sugar was adjusted to 40g/l by adding glucose. Fermentation of the samples was done in batch cultivation by *Saccharomyces cerevisiae*. Ethanol concentration was measured at 18h and 36h. Experimental design in full factorial mode was done by minitab16 software.

Results: Among 12 tested detoxification condition, in pH 12 and 60 for 60 minutes, furfural and glucose was decreased 73% and 77%, respectively, ethanol production (yield) was increased 44% in comparison with non-detoxified hydrolyzed medium in 18h batch cultivation.

Conclusion: Increasing the pH, time and temperature showed more effective in decreasing furfural and resulted better fermentability, although caused a significant decline in glucose concentration, too. The effect of temperature was not as drastic as the pH and time. Finally our research demonstrated that detoxification improved ethanol production and decrease fermentation time, consequently raised ethanol yield.

Keywords: Sugarcane Bagasse; Aliphatic Acid; Furfural; Phenol; Detoxification; *Saccharomyces cerevisiae*